

STS 117 Return Samples: Assessment of Air Quality aboard the Shuttle (STS-117) and International Space Station (13A)

The toxicological assessments of 2 grab sample canisters (GSCs) and one pair of formaldehyde badges from the Shuttle are reported in Table 1. Analytical methods have not changed from earlier reports. The recoveries of the 3 surrogates (¹³C-acetone, fluorobenzene, and chlorobenzene) from the 2 GSCs averaged 109, 95, and 97 %, respectively. Three formaldehyde controls averaged 93% recovery. The Shuttle atmosphere was acceptable for human respiration.

Table 1. Analytical Summary of Shuttle Samples

Sample Location	Date of Sample	NMVOCs ¹ (mg/m ³)	T Value ² (units)	Alcohols (mg/m ³)	Formaldehyde (μg/m ³)
Middeck (preflight)	6/08/07	0.2	0.01	0.2	--
Flight deck	6/18/07	--	--	--	47
Middeck (end mission)	6/22/07	4.2	0.66	1.0	--

¹ Non-methane volatile organic hydrocarbons.

² Calculated excluding CO₂, formaldehyde, and siloxanes.

The toxicological assessment of 14 GSCs and 8 pairs of formaldehyde badges from the ISS is shown in Table 2. The recoveries of the 3 standards (as listed above) from the GSCs averaged 108, 104 and 98%, respectively. Three formaldehyde control badges [STS-118 return] averaged 85% recovery.

Table 2. Analytical Summary of ISS Results

Module/Sample	Approx. Date	NMVOCs ^a (mg/m ³)	T Value ^b (units)	Alcohols (mg/m ³)	Formaldehyde (μg/m ³)
SM	1/17/07	9	1.48	6	26
FGB	1/17/07	6	0.58	4	--
Lab	1/17/07	6	0.54	5	35
SM	2/15/07	4	0.55	3	29
FGB	2/15/07	5	0.57	3	--
Lab	2/15/07	4	0.13	3	41
SM	3/15/07	8	0.13	6	--
FGB	3/15/07	7	0.57	6	--
Lab	3/15/07	8	0.16	6	--
SM	4/17/07	6	0.15	5	21 ^{c,d}
FGB	4/17/07	7	0.15	6	--
Lab	4/17/07	7	0.48	5	35 ^{c,d}
SM	5/14/07	6	0.13	4	21 ^d
Lab	5/14/07	5	0.10	4	32 ^d
<i>Guideline</i>		<25	<1.0	<5	<120

^a Non-methane volatile organic hydrocarbons.

^b Calculated excluding CO₂, formaldehyde, and siloxanes.

^c Sampled from 4/25 to 4/27

^d Samplers returned aboard STS-118

The ISS atmosphere was found to be acceptable for human respiration. The high T-value of 1.48 on 1/17/07 was due to elevation in C2-C7 aliphatic aldehydes and a small amount

of propenal, which contributed 0.87 units to the total T-value. Since these increases were not identified in the concomitant samples of Lab and FGB air, one must assume a local source in the SM; however, there is no toxicological concern since the T-Values were not elevated in the other modules. The alcohols were near or below the threshold established for protection of the water recovery system. Formaldehyde badges continue to show that the SM has a slightly lower concentration of formaldehyde than the Lab, but both modules are well below the guideline level.

Enclosures

Table 1A: Analytical concentrations of compounds found in the STS-117 GSCs

Table 1B: Analytical concentrations of compounds found in 13A GSCs

Table 2A: T-values of the compounds in table 1A

Table 2B: T-values of the compounds in table 1B